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TWO ARTICLES ON JAPANESE ENCEPHALITIS FROM SOVIET PERIODICAL

/Comment: The following information on Japanese encephalitis is taken from two articles in Priroda, Soviet periodical, for July 1953. The author of the first article is Li K'o-min, and of the second, Academician Ye. N. Pavlovskiy.

A short bibliography is appended. Numbers in parentheses refer to appended sources./

Li K'omin's Article

Although it has been known that Japanese encephalitis has occurred in China for a considerable time (an epidemic was described 30 years ago), very little attention was paid to this disease until the foundation of the People's Republic of China. In 1942, Dr En /Yen?/ isolated a strain of the virus of Japanese encephalitis from the brain of a man who had died of the disease. In 1951, Dr Huan isolated this virus from the mosquitoes Culex pipiens and Aedes chemulpoensis, thus proving that mosquitoes may function as transmitters of the disease.

It was established that infectious encephalitis occurs in China over a territory extending from Port Arthur to Canton and from Shanghai to Sian. In 1951, the number of persons who had the disease throughout China was 4,000. More than 1,300 of these died. In some localities (Mukden, Peiping, Tientsin, Canton, etc.) epidemic outbreaks have occurred.

Japanese encephalitis is a seasonal disease which occurs in China July - October, with the maximum number of incidences in August and September. In Northeastern China, the epidemic season continues for 70-80 days. In Peiping, cases of Japanese encephalitis are observed starting with the beginning of July. The number of cases reaches a maximum in the middle of August and drops sharply at the end of August. In Nanking, the epidemic season starts earlier than in Peiping and ends later: cases of Japanese encephalitis are observed in

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Nanking as late as November. The reason for this is that the temperature and the humidity are higher in Nanking, so that the breeding of mosquitoes, particularly those of the Aedes genus, is favored there.

At present, it has been definitely established that the following mosquitoes serve as transmitters of Japanese encephalitis in China: Aedes albopictus, A. chemulpoensis, A. togoi, A. dorsalis, Culex tritaeniorynchus, and C. pipiens.

The work of USSR scientists in Primorskiy Kray and of some Chinese investigators in China itself has led to the discovery that mosquitoes of the Aedes genus transmit Japanese encephalitis. This discovery has stimulated investigation by Chinese scientists of representatives of the Aedes genus. At present, the existence of 29 species of Aedes mosquitoes has been established in China, but the epidemiological significance of all these species is not yet known.(1)

Pavlovskiy's Article

Japanese encephalitis was discovered in Japan in 1924. In that year, there were 6,125 cases of the disease in Japan. In subsequent years in Japan, the number of cases per year varied from 72 to 5,370 (the last figure is for 1935). In 1939, there was an extensive epidemic, which spread throughout Tokyo. In Japan this type of encephalitis occurs in many ken, particularly those which border on the Inland Sea. The causative agent of the disease is a virus, as demonstrated in experiments on monkeys and later on white mice.

On the basis of some experimental results, it was assumed that the disease is transmitted by the inhalation of droplets spread by infected persons. However, the local character of the disease and the fact that it occurs seasonally contradict this assumption. It was established later that the virus is transmitted by bloodsucking mosquitoes. Mosquitoes fed on human b ings suffering from Japanese encephalitis or mice infected with this disease infect healthy mice provided the mosquitoes are kept at a temperature no lower than 21° C during the intermediate period.

Also, it was later found that many species of mosquitoes that do not transmit malaria (Aedes albopictus, A. chemulpoensis, A. togoi, A. dorsalis, Culex tritaeniorynchus, C. pipiens) serve as transmitters of the virus of Japanese encephalitis. Both in Japan and in China, the virus was occasionally isolated from freely flying mosquitoes after they had been captured. Because it is transmitted by mosquitoes, Japanese encephalitis is often referred to as mosquito encephalitis. It is also known as autumn encephalitis, because the mosquitoes which cause it are prevalent in the autumn.

Not all human beings and susceptible animals which have been infected by mosquitoes with the virus of Japanese encephalitis get the disease; some remain healthy, but become carriers of the virus by reason of the latent infection which they acquire. The virus of Japanese encephalitis could be isolated from the blood of human beings who never had the disease.

It was further established that, as a result of a latent infection, antibodies counteracting the virus of Japanese encephalitis are formed in the blood of virus carriers. If the blood serum of a human being or animal having a latent infection as a result of which antibodies have developed is mixed with a lethal dose of the virus, and if the mixture is then injected into a white mouse, the mouse will live and will not catch the disease. The reason for this is that the antibodies to some extent neutralize the pathogenic properties of the virus.

It is highly probable that mosquitoes of the above enumerated species acquire the infection not only from patients whose blood contains the virus but also from healthy virus carriers.

Since animals carry the virus, they may form stages of the circulation of the virus in the territory which they inhabit. Mosquitoes bite these animals and spread the infection to other animals. As a final result of the spread of the infection among animals, human beings may become infected after mosquitoes have transmitted the virus to them. Depending on the dose of virus which the human subject has received in this manner and on his physical condition, he either acquires the disease or becomes a virus carrier.

That the virus of Japanese encephalitis is concentrated in definite localities is apparent from the following findings. Horses from localities where Japanese encephalitis does not occur were brought to Tokyo. The blood of these horses contained neither the virus of Japanese encephalitis nor antibodies acting against it. After a while, the virus appeared in the blood of some of the horses. Somewhat later, the serum of the horses affected in this manner acquired the capacity of killing the virus. This can happen only when animals have been subjected to the attack of bloodsucking mosquitoes which have transmitted the virus.

The virus of Japanese encephalitis is much more widespread than the incidence of the disease would indicate. The serum of many animals, e.g., horses, cattle, and swine, has the property of killing the virus. Occasionally the serum of a very nigh proportion of the animals exhibits this property.

Japanese encephalitis occurs in southern localities: the northern islands of Japan are free from it. It also occurs in the Phillipines. In the USSR, Japanese encephalitis appeared in a limited territory adjacent to Lake Khasan after the Japanese had attacked that part of the USSR. In consequence of the outbreak of the disease at Lake Khasan, a detailed investigation of Japanese encephalitis became necessary. This investigation was extended to the neighboring parts of China and Northern Korea.

Another type of seasonally occurring encephalitis, i.e., the spring-summer or tick encephalitis, also has a natural reservoir. Infection with this disease can result from a sojourn in a tick-infested wooded area. On the other hand, mosquitoes transmitting encephalitis may bite human beings in villages and cities.

The question of the existence of natural reservoirs of Japanese encephalitis was answered by P. A. Petrishcheva, who was chief of an expedition and who has worked for a number of years on this subject. In the course of his work, it was established that mosquitoes which transmit the disease are present in certain areas, that they attack certain animals and birds, and that in addition to animals, some wild birds also function as carriers of Japanese encephalitis. A correlation of all these data indicates that natural reservoirs of Japanese encephalitis actually exist.(2)

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2. Academician Ye. N. Pavlovskiy, "Some Remarks on Japanese Encephalitis," Priroda, Vol XLI, No 7, 1953, pp 76-78.